

THE  
*Cane Growers'*  
QUARTERLY BULLETIN

VOL. XXIII, No. 3

1 JANUARY, 1960



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BUREAU OF SUGAR EXPERIMENT STATIONS  
BRISBANE

THE  
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QUARTERLY BULLETIN

ISSUED BY DIRECTION OF THE  
SUGAR EXPERIMENT STATIONS  
BOARD

1 JANUARY, 1960



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## The Cane Growers' Quarterly Bulletin

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### EDITORIAL

## The Sugar Cane Surplus

*From time to time this Bulletin has described methods which have been evolved for dealing with unharvestable cane—whether the reason for destruction has been frost, drought or lack of market for the crop.*

*But the mode of dealing with cane which is surplus to requirements, but otherwise in good condition, is merely the solution of a disposal problem which should not have attained present-day magnitude.*

*There are many reasons for the surplus which has embarrassed the industry in the last two seasons, and which promises to recur in 1960. These include the nature of the seasons experienced, the improvements in varietal performance and the relation between assigned acreages and mill peaks.*

*The effects of seasons are beyond industry control; no one would condone any retardation of the progress in field efficiency, since that is one of the few avenues for reducing production costs; but an examination could be made of the entire complex which includes gross and nett assignments, farm peaks, mill peaks and the relation between one and the other.*

*Wherever the solution to the problem might lie, and whatever action might be taken in the future to abate the difficulty, cognisance must be taken of the fact that more than a year's notice is essential. Action taken today cannot affect the size of the 1960 crop, but it would be in time to influence plantings for 1961 harvest.*

## Lawrence Guy Scotney

On November 25th, 1959, the Bureau of Sugar Experiment Stations lost one of its industry Board members in a tragic road accident; and the sugar industry of the State mourned the passing of one of its leaders on the Queensland Cane Growers' Council.

Mr. Laurie Scotney, who had spent his life as a cane grower, had served in many capacities wherein he aimed at improvement in growers affairs. But the Bureau will remember him as one who served for considerable periods in an administrative and advisory capacity in Bureau matters.

From 1947 to 1951 he was a growers' representative on the Sugar Experiment Stations Advisory Board and, later, after the creation of the new Sugar Experiment Stations Board, he was sole growers' representative from March, 1953, to the day of his death.

During this important developmental period in the expanding affairs of the Bureau, Mr. Scotney was the canegrowers' spokesman

on the Board, and his wealth of experience in growers' affairs and in the requirements of the cane farmer ensured that his advice was sound and practical. He played no small part in the Bureau's extensive building programme during those years.



Early in 1956 Mr. Scotney visited India as a delegate from the Sugar Experiment Stations Board to the International Sugar Technologists' Congress in that country. Before returning to Australia he also toured the sugar industry of the Philippines with other Queensland delegates

to study research matters in those islands.

Laurie Scotney served his industry well, and will be long remembered by his many friends. As a grower he was successful and progressive; as an advocate in the councils of the growers he was sincere; and in his term of service with the Sugar Experiment Stations Board his outlook was never bounded by the limits of his own district.

## A Century of Sugar\*

By NORMAN J. KING

If the sugar industry in Queensland decides to record its one-hundredth year of existence it will have to decide between the year when crystal sugar was first made in the State, when commercial cultivation of sugar cane began and when the first mill commenced operation. Be that as it may, this centenary year of the State does coincide with the year when six pounds of sugar was made in Brisbane from a small quantity of sugar cane grown in the Botanic Gardens.

So, in retrospect, our great modern industry can look back over 100 years of development with its small beginnings in the capital city but its rapid expansion along 1000 miles of coastline with its northern outpost at Mossman. In 1859 there was not one acre of land under sugar cane although, even as early as that, there were 3½ million sheep in the State. To-day half a million acres are devoted to this crop, 10,000,000 tons of cane are grown annually, and over a million and a quarter tons of sugar produced. The present day value of the sugar is over £60 million, a figure which runs neck and neck with the value of the wool clip.

By 1900 the Queensland sugar growers were producing 800,000 tons of cane, and the output of sugar was 93,000 tons, from 58 sugar mills. What a contrast to-day! The crop has increased twelve fold, but the number of mills is only three-fifths of those in existence at the turn of the century. Inefficient factories have disappeared, and the remainder have grown larger as the crops increased and the markets for sugar grew.

It was also in 1900, just 59 years ago next month, that the Government, at the request of the industry, passed the important legislation which married research to agriculture. This legislation created the Bureau of Sugar Experiment Stations, and sugar became

the first industry in Australia to have its own research organization. Since that time sugar production has progressed from its teenage to a virile maturity, and its efficiency ranks with the world leaders. The fact that total production has soared is not necessarily a sign of increased expertness; but the yardstick of its technical progress lies in the vastly higher production per acre, the increased sugar content of cane, the higher recovery of sugar, and a host of other things. The conquest of pests and diseases is well known, as is also the remarkable contribution made by successful breeding of improved cane varieties.

Much has been achieved during the century of sugar's existence, but in an industry of such size and complexity, in its wide geographical range, in its rainfall variation from 40 to 200 inches a year, it is only natural that many things in both field and factory are still capable of improvement. Cultivation techniques are evolving all the time, weed control is by no means as good as desired, some diseases and pests still pose control problems and factory efficiency—although high—can progress still further.

The best use is being made of modern techniques and materials, and an example of this ready adaptation of contemporary methods is the recent use of a radio isotope in a sugar mill to study a manufacturing process. In this case the Bureau of Sugar Experiment Stations co-operated with the Australian Atomic Energy Commission in applying this new technique to the study of an old problem.

The industry is not static, despite existing over-production of sugar. The surplus is not the result of unplanned expansion of area; on the contrary, areas are very strictly controlled. Too much sugar is being produced because, on the one hand, there has been a

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\* A broadcast over the National ABC network.

succession of favourable seasons and, on the other, production efficiency is increasing the amount of sugar grown on each acre. It is important that the industry does not lower its efficiency standards merely because it is producing too much. A higher output on each acre is the sole means of defeating rising costs, and every technical means will be exploited to achieve this end. If total production must be curbed, it can be done only by reducing the area being farmed.

As sugar markets increase—and they must increase steadily with a growing population—the industry will grow accordingly. There is, as yet, no shortage of suitable land for expansion. The Queensland coast and most of its chain of large towns have been developed by sugar. Further expansion will mean more families settled on the land, bigger markets for products manufactured in the South, more amenities for rural dwellers and more employment in both field and mills.

I just said that there is no shortage of suitable land. In fact, there are considerable areas as yet uncleared and undeveloped, because there are no other tropical crops which can be grown and marketed economically. And, in addition, there is much land of the poorer, marginal type which will doubtless be used for sugar growing in the future. Modern cane breeding methods are producing cane varieties which give excellent crops on soils which were once considered to be waste land. The wheat breeders of the world have shown that the frontiers of wheat growing can be extended into the Arctic Circle and into the sub-tropics. Cane breeders have demonstrated that they, also, can tailor the crop to the climatic environment, and the future will witness the extension of sugar growing into areas not at present thought of.

Among the spectacular developments in the past couple of years are the great bulk sugar terminals built at the ports of Mackay, Lucinda Point, Bundaberg and Townsville, to which

will be added next year the terminal at Mourilyan Harbour. These five projects costing, in the aggregate, some £9,000,000 are paid for by the sugar industry. This modern method of handling raw sugar without bagging it results in cost savings and ensures loading of ships in one-tenth of the time previously taken. Bulk handling has removed a serious and costly bottle-neck in sugar transport.

Another problem of considerable magnitude being tackled by the industry is the mechanization of harvesting the cane crop. That this matter has not already been solved is not due to lack of effort. For over half a century several sugar producing countries have invented and scrapped hundreds of machines which failed to do the job effectively. Those not conversant with the sugar cane crop might question the difficulties involved in such a process. Let us look briefly at the problem. There is the bulk of the crop—anything up to 70 tons of cane per acre; there is the fact that each of the 30,000 stalks on an acre of land must be cut off level with the ground; and each of these stalks should be topped correctly to remove the leaves—and that in a crop where considerable variation exists in stalk length; then there are the effects of strong winds, cyclones and floods which have caused much of the cane to lean over or to be lying flat on the ground. These are only some of the obstacles to be handled by a cane harvester. There are already several successful machines which can handle erect cane crops and, one by one, the other difficulties are being overcome.

The industry's investigations into mechanical harvesting are not directed solely at keeping costs down. The other reason, and the prime one, is that the source of harvesting labour may one day be insufficient for requirements. Even to-day the labour force is kept at full strength only because of a yearly intake of migrants. This position can change drastically within a short time, and the industry must be

prepared to mechanise the harvest at fairly short notice.

The green leaves and tops on the cane stalks are not destroyed in the pre-harvest burning, and these constitute an unwanted adulterant in the cane supplied to the mill if the stalks are not adequately cleaned. Experiments are now under way with chemical sprays which act as leaf desiccants. Such substances, if effective, could be sprayed on to crops some time previous to harvest, thus promoting better burns and removing the extraneous material.

For 25 years now Queensland has been a sugar exporter and, until a couple of years ago, it was able to sell, on the overseas markets, all the production which was surplus to Australia's requirements. The fixation of our export quota to a definite tonnage means that, in any favourable year, the existing acreage under sugar cane will produce an unsaleable surplus. The immediate solution is, of course, to reduce areas being farmed; but as a long-term project the industry is looking for some other uses for sugar than as a food. For some years the Sugar Research Foundation in America has been working on such research, and the local sugar industry has recently taken the matter up with C.S.I.R.O., and is attempting to interest that organization in developing sugar-based chemicals for industry.

Quite good use has been made of the by-products which result from raw sugar manufacture, but more can be done and, doubtless, will be done in the future. The fibrous portion of the cane, which is called bagasse after the juices have been extracted, is used as the sole fuel in the sugar mills; coal, oil and wood are no longer burnt. The muds resulting from juice

clarification, and amounting to some quarter of a million tons a year, are all returned to the cane fields as a low grade fertilizer. The molasses remaining after crystallization of the sugar is used partly as a fertilizer, partly as stock food and, to a large degree, for fermentation into alcohol.

With increasing mill efficiency there has now developed a large surplus of bagasse which can be converted into paper, hardboard and corestock, and there is a growing interest in various quarters in a new industry based on this material. It is possible also that future years will see a change in molasses usage. The pattern in America has been that a petrochemical industry can produce alcohol more cheaply than by fermentation of molasses, and one might expect that the new petrochemical industry in Australia will have the same result.

One hundred years of sugar growing and manufacture in Queensland have seen tremendous changes and improvements, and a rate of technical and industrial progress which has not been exceeded by any other primary industry. But, although there may be some justification for pride in accomplishment, there is no room for complacency. Progress has been faster in the last few decades than in the early days of sugar growing, but we have had the advantages of modern techniques and materials and have made full use of them. There are still many problems to solve and obstacles to overcome, and the sugar industry—our State's largest agricultural undertaking—will continue its endeavours to retain its position as not only the largest, but the most efficient in the agricultural field.

## Items of Interest

### FROM THE BUREAU'S 59th ANNUAL REPORT.

The following brief extracts from the 1959 Annual Report of the Bureau will be of interest to growers in various districts.

#### **The Relative Values of Old and New Varieties.**

Following the discovery of ratoon stunting disease, and the development of the concept that this could be a major cause of yield decline in varieties, advantage was taken of the opportunity afforded to test the relative yields of old favourites (M1900 Seedling, Black Innes, D.1135, Q.813, P.O.J. 2725, Co.281, Co.290), and new varietal productions. Having cleaned up any ratoon stunting disease in the old canes and ensured that it did not exist in stocks of the newer ones, yield trials were planted, and the results obtained over a rotation including a plant and two ratoon crops. Three trials were conducted, and in the aggregate eight of the old varieties were compared with six present day canes of commercial importance. In each case, without exception, the newer canes proved superior in all crops.

This is the first occasion, in this country, that such a comparison has been possible, under disease free conditions, and with the same growth environment. The results gave assurance, if such were needed, that cane breeding results are positive, and that they have not merely retained the *status quo* against the attacks of the mysterious yield decline.

#### **Progress of the anti-lodging Canes.**

The advent of Q.57, Q.66 and Q.76, previously mentioned in these reports, was the beginning of an era of breeding varieties which can resist lodging in large crops, and under high-wind and flood conditions. Q.57 has been found in addition, to possess the ability to produce high sugar content under the low sunlight conditions which charac-

terise the wet belt. Its progress in such areas has been spectacular. The extension of Q.66 has been slowed down deliberately because of its susceptibility to leaf scald disease, but there is growing evidence that the danger lies in its being grown adjacent to other diseased varieties. In the absence of appreciable reservoirs of the disease in adjacent fields, Q.66 appears completely or relatively disease free. This may be the solution of the problem of using this valuable cane on the very rich lands for which it is admirably suited. Q.67 is finding its place on the rich lands of the Lower Burdekin delta, and is extending slowly into other areas.

#### **The Climatic Range of Varieties.**

Queensland's lengthy sugar coastline—extending for over 1000 miles north and south—introduces climatic divisions which would not appear to lend themselves to the use of the same varieties. Such used to be the case, and the northern, central and southern areas had groups of varieties specifically suited to the climatic conditions.

Modern hybrids appear to have a greater range of adaptability, and it would appear, on experience to date, that those selected in the central zone are more likely to be useful in the northern and southern sectors than is found in reverse. The success of Q.50 and Q.58 in both North and South Queensland, and the early promise shown by Q.68, suggest that future central district canes may give a useful performance in other areas. It may be significant, however, that none of these central-district canes has found a place in the very wet belt, which appears to need larger-barrelled but less vigorous types.

#### **New Seedling Plots.**

The policy of growing and selecting seedling canes in the environment in

which they are to be commercialised has been extended to the districts of Tully and Childers. Within the few years that the Innisfail sub-station has been operating, the selections have been of such a high standard, compared with the best commercial canes, that a degree of optimism regarding its future is justified. Although the Tully area is remarkably close, and in the same high rainfall zone, a seedling introduction plot has been established there to supplement the Innisfail work. Similarly at Childers, near Bundaberg, where few Bundaberg seedlings have succeeded, an attempt will be made to improve matters by local selection.

Limitations of staff govern the number of such sub-stations which can be operated effectively but, should experience indicate any appreciable degree of success with the new ventures, consideration must be given to an expansion of this form of work.

#### Soil Salinity and Cane Growth.

The subject of soil salinity and its effect on crop development did not receive any attention until recent years, when expansion on to some marginal lands brought certain salt affected areas to light. The worst of these occur in locations where the land elevation is only slightly above sea level, besides being in close proximity to tidal influence. These two factors combine to make adequate drainage more difficult and, with impeded drainage, the leaching of the salt will be longer delayed. Fortunately, the areas involved are not large, and are represented, in the main, by irregular patches in the lower parts of a number of farms. The salt concentration in the soil varies from a slightly toxic level to the stage where germination and early growth are virtually inhibited. Standards of conductivity have been established, allowing rapid and ready diagnosis of the condition, and providing reasonably precise information on the behaviour of crops which may be planted. Varietal investigations

are in train in an endeavour to select types which may possess a greater than normal tolerance to the saline soil condition.

#### Breeding for Two-Year Canes.

A direct result of the crop restriction which fixed markets are imposing on the industry is the standing over of surplus cane crops. By and large the varieties commonly grown in Queensland are not suited to a two-year growth term. Some cognisance is being taken of this economic position in varietal selection, and two varieties suitable for two-year cropping are being distributed in the Isis area.

However, there are obvious dangers in a planned switch-over to two-year-old canes. The lodging problem must be accentuated, with resultant higher harvesting costs; two-year-old cane will provide better rat harbourages and make baiting campaigns more difficult; the beetle borer population could assume pest proportions in a short time; and mechanical harvesting would become an even greater problem than it is now.

There are many advantages inherent in the existing annual harvest procedure, and there would appear to be little to gain in a change to two-year cropping.

#### A New Strain of Mosaic?

The discovery of what may be a new strain of mosaic disease in part of the Mackay area is a matter of some concern. Although not yet proven by inoculation into a series of test varieties, the variation in pattern gives grounds for belief that strain mutation has occurred in this country as it has done in others. Much has been achieved in cleaning up mosaic disease in sugar cane in several of our districts and, since the discovery of this new form, a strong effort has been made to confine it, and to eradicate it in known infected farms. The principal danger, with a new strain, is that it may prove pathogenic on a valuable variety which is resistant to the older form.

### **The Ratoon Stunting Disease Campaign.**

This has continued in a somewhat abated form. Now that virtually all growers have the bulk of their crop grown from the progeny of hot water treated stock, the aim is to ensure that there is an infusion of new, treated material every couple of years. The small percentage of "escapes" during the treatment, plus the anticipated reinfection through inadequate farm hygiene, ensures that a goodly proportion of farms will require new plant stocks periodically. A deal of investigation has been directed at improving germination following hot water treatment and the methods adopted include full-stalk treatment as opposed to "sett" treatment. Some caution is necessary to ensure that the methods employed do not improve germination at the expense of the curative effect.

### **Progress with Chlorotic Streak.**

After a lengthy period, during which virtually no progress was made in understanding this disease, Bureau pathologists achieved a major step forward by demonstrating transmission from diseased to healthy plants in water cultures. Although the initial work was not performed under insect-free conditions, the weight of evidence favours a water-inhibiting factor as being the cause of the disease or the vector for its spread. More detailed investigation work is now in progress both in north and south Queensland, and the transmissions already obtained may be the necessary break-through to a better understanding of this puzzling complaint of the sugar-cane plant.

### **Hardboard from Bagasse.**

This project, conducted in association with Monsanto Chemicals (Aust.) Ltd., continued during the year. The bagasse resin boards produced were of good quality, and the test data obtained by the University of Queensland showed them to be comparable

with commercially marketed hardboards. Board samples and test data were submitted to a group of sugar millers who form the Mackay Sugar Manufacturers Association, and all available detail was supplied. The project will probably be continued, studying the production of thicker, less-dense boards suitable for core-stock.

### **Extra Land for Cane Breeding.**

The obstacle to expansion of our cane breeding activities has largely been overcome by the purchase of additional acreage adjacent to the Meringa Experiment Station. The proximity was essential in the interests of efficient operation, and the land became available just in time to allow planned expansion of this activity. Although not high quality land, the area is uniform and should be suitable for the experimental work and replicated lay-outs associated with cane breeding. The main area of the Meringa Station is not suited to field experimentation because of extreme soil variability, and the growing statistical emphasis in seedling selection makes soil uniformity essential.

### **Deterioration of Cut-up Cane.**

In view of the promise shown by the Massey-Ferguson cane harvester, it was considered advisable to investigate the possibility of sugar losses from the cut-up sections of the cane stalks which occur as a result of the technique employed by this machine. An extensive series of trials was therefore carried out at each of the four experiment stations, and these were designed to measure the deterioration of stalks cut into sections, approximately one foot in length, in comparison with that of the whole stalk as obtained in the normal method of harvesting. These comparisons were made in the early, middle and late parts of the crushing season, and the three major varieties in each of the four areas were used. These were:—Q.50, Q.57, Q.58,

Badila, Trojan, Pindar, C.P.29/116 and N.Co.310.

In all, over 5,000 weighings and c.c.s. analyses were made and the weight and c.c.s. losses were calculated for all districts, periods and varieties at two days and four days after harvesting.

The results of this work suggest that this method of harvesting might, in the normal elapsed time from harvesting to milling, be responsible for the loss of c.c.s. of the order of one per cent, i.e., one ton of c.c.s. for each 700 or 800 tons of cane. In round figures this could be estimated as a little less than 1/- per ton of cane, which is considerably less than the anticipated reduction in harvesting costs if the machine proves successful. There were indications that the effect of weather conditions on some varieties could be important.

#### Ratooning Experiments.

Two long range ratooning experiments are being carried out on the Lower Burdekin Experiment Station, to ascertain whether agronomic factors influence the growing of ratoons in this area. Plant cane of three varieties in a quantitative trial was harvested in 1958 (some plots being ploughed out after harvest, and prepared for planting in 1959 following a predetermined plan), while others were ratooned. From the plots which were ratooned, and those planted in 1958, a comparison of plant and first ratoon crops, under similar seasonal conditions, will be available during the 1959 harvest, while the following year comparisons between plant, first and second ratoons should provide useful information. Unfortunately, one of the varieties in the trial, Pindar, suffered severe breakage of tops in the February cyclone.

Plant cane harvested in 1957 and first ratoons in 1958 showed a dropping off in yield in a qualitative ratooning trial in the three varieties, Trojan, Pindar and Q.57, the following tonnage yields being recorded:—

| Variety | Tons cane<br>per acre |               |
|---------|-----------------------|---------------|
|         | Plant Crop            | First Ratoons |
| Trojan  | .. 60.43              | 50.56         |
| Pindar  | .. 62.32              | 46.84         |
| Q.57    | .. 54.31              | 38.40         |

The second ratoon crop was well developed and showed little damage from strong winds.

#### Seedling Raising.

Good seed germination was experienced in 1958 at all stations, and there is no doubt that seed-set in the 1958 cross-pollination campaign must have been excellent. The growth of the young seedlings in the flats filled with the mill filter cake compost, as mentioned in last year's annual report, was again excellent, and there were sufficient seedlings produced at three stations to enable areas to be devoted to bunch planting.

At Meringa, 8,029 seedlings were single planted and 35,860 were planted in bunches, giving an approximate total of 44,000 seedlings. At the Burdekin there were 6,119 single-planted seedlings and 6,870 in bunches, giving a total of 13,000 seedlings. At Mackay the total was 10,700 seedlings made up of 8,336 single-planted and 2,630 in bunches, whilst at Bundaberg 5,827 seedlings were single-planted. Thus, an approximate grand total of 73,500 original seedlings were planted in 1958 at the four stations.

## Abnormalities in Young Ratoons

By C. G. Hughes

Queer effects sometimes show in young ratoons, and the observant farmer is often justifiably alarmed, even though he expects from previous experience that nothing is seriously wrong with the young crop. The effects may take the form of a yellowing in small or large patches of the rows of small cane shoots; or the stark white-

had been cut in May and, when seen in early July, had just been opened up by the removal of the standing cane. It was vigorously ratooning Q.63, and small yellow patches and dried tips of the leaves in sections of the rows could be seen from the end headlands. The patches of yellow shoots could have been due to the fact



Fig. 44—Patchy yellowing in young ratoons, probably the result of sawdust residues.

—Photo C. G. Hughes

ness of albino shoots may be more prominent than usual; or a disease normally hidden in the obscurity of large cane may suddenly become apparent. The effects can occur in open fields of ratoons but they are more frequent in the little pockets of out-of-season ratoons coming away, often through blankets of trash, where plants have been taken. Such a small area on a farm at Foulden, Mackay,

that the farmer had a saw-bench there not so long ago, and uneven distribution of the saw-dust could well have given this effect in the young ratoons. Elsewhere the young shoots were showing in abundance the characteristic "eyes" and "runners" of the streaks of eye-spot disease. This is normally not a serious disease in Q.63, although in this instance the loss of leaf tissue was sufficiently

great to stunt the young shoots. The prognosis is that the ratoons will grow away from both afflictions, but this is not meant to imply that farmers should dismiss all abnormalities in young cane in a similar situation. This particular farmer did well to call in his local Cane Pest and Disease Control Board officer, and any other farmer similarly observant of what

appear to be inexplicable effects should immediately contact such an officer or a Bureau officer. It could be the means of saving a farmer an infection in his other cane.

The photograph shows the yellowing; the effects of eye spot are not so obvious in a black and white reproduction.

## Distributing New Varieties

In the Tully, South Johnstone and Mourilyan areas a distribution of the new variety Q.66 was made during the spring of 1959, under permit, to growers with rich land to which the variety is suited. The accompanying photograph shows growers collecting plants from one farm plot in Tully. Bureau and Pest Board officers within the areas organize varietal distributions by

setting suitable dates, allocating quantities and collecting on-the-spot payments. The procedure allows all interested growers an equal and early opportunity of securing a new variety in an orderly manner, protects the plot holder, and ensures rapid removal of the cane to enable satisfactory ratooning.

S.O.S.



Fig. 45—Distribution of Q. 66 from a clean plant source at Tully.

—Photo S. O. Skinner

## The Sugar Experiment Stations Acts, 1900 to 1957

### LIST OF VARIETIES OF SUGAR CANE APPROVED FOR PLANTING, 1960

Bureau of Sugar Experiment Stations, Brisbane, 1st January, 1960

#### **Mossman Mill Area**

Badila, Co.475, Comus, Pindar, Q.44, Q.50, Q.57, Q.59, Q.64, Q.66, S.J.4, Trojan and Vidar.

#### **Hambledon Mill Area**

Badila, Comus, Eros, Pindar, Q.50, Q.57, Q.59, Ragnar and Trojan.

#### **Mulgrave Mill Area**

Badila, Cato, Co.475, Comus, Pindar, Q.44, Q.50, Q.57, Q.59, Q.64, Q.66, Q.67, S.J.4, and Trojan.

#### **Babinda Mill Area**

Badila, Co.475, Pindar, Q.44, Q.50, Q.57, Q.59, Q.64, Q.66, Q.67, Trojan and Vidar.

#### **Goondi Mill Area**

Badila, Badila Seedling, Castor, Pindar, Q.44, Q.57, Q.59, Trojan, and Vidar.

#### **South Johnstone Mill Area**

Badila, Badila Seedling, Clark's Seedling, Pindar, Q.44, Q.57, Q.59, Q.64, Trojan and Vidar.

#### **Mourilyan Mill Area**

Badila, Badila Seedling, Clark's Seedling, Pindar, Q.44, Q.50, Q.57, Q.59, Q.64, Trojan and Vidar.

#### **Tully Mill Area**

Badila, Badila Seedling, Clark's Seedling, Pindar, Q.44, Q.57, Q.59, Q.64, Trojan and Vidar.

#### **Victoria Mill Area**

Cadmus, Damon, Eros, Luna, Pindar, Ragnar, Sirius, Trojan, Q.50, Q.57 and Q.58.

#### **Macknade Mill Area**

Cadmus, Damon, Eros, Luna, Pindar, Ragnar, Sirius, Trojan, Q.50, Q.57 and Q.58.

#### **Invicta Mill Area**

North of Townsville  
Eros, Pindar, Q.50, Q.57, Q.58, Ragnar and Trojan.  
South of Townsville  
Pindar, Q.50, Q.57, Q.67, S.J.16, and Trojan.

#### **Pioneer Mill Area**

Badila, Comus, Pindar, Q.57, Q.67, S.J.16 and Trojan.

#### **Kalamia Mill Area**

Badila, Comus, Pindar, Q.50, Q.57, Q.67, S.J.16 and Trojan.

#### **Inkerman Mill Area**

Badila, Comus, Pindar, Q.50, Q.57, Q.67, S.J.16 and Trojan.

#### **Proserpine Mill Area**

C.P.29/116, N.Co.310, Pindar, Q.50, Q.56, Q.57, Q.58, Q.63, Q.65, Q.68, Q.73 and Trojan.

#### **Cattle Creek Mill Area**

Comus, N.Co.310, Pindar, Q.28, Q.50, Q.57, Q.58, Q.63, Q.65, Q.68, Q.73 and Trojan.

#### **Racecourse Mill Area**

N.Co.310, Pindar, P.O.J.2878, Q.28, Q.50, Q.56, Q.57, Q.58, Q.63, Q.65, Q.68, Q.73 and Trojan.

#### **Farleigh Mill Area**

N.Co.310, Pindar, P.O.J.2878, Q.28, Q.50, Q.57, Q.58, Q.63, Q.65, Q.68, Q.73, and Trojan.

**North Eton Mill Area**

N.Co.310, Pindar, P.O.J.2878, Q.50, Q.57, Q.58, Q.63, Q.65, Q.68, Q.73 and Trojan.

**Marian Mill Area**

Comus, N.Co.310, Pindar, P.O.J. 2878, Q.28, Q.50, Q.57, Q.58, Q.63, Q.65, Q.68, Q.73 and Trojan.

**Pleystowe Mill Area**

N.Co.310, Pindar, Q.28, Q.50, Q.57, Q.58, Q.63, Q.65, Q.68, Q.73 and Trojan.

**Plane Creek Mill Area**

N.Co.310, Pindar, Q.50, Q.57, Q.58, Q.63, Q.65, Q.68, Q.73 and Trojan.

**Qunaba Mill Area**

C.P.29/116, N.Co.310, Pindar, P.O.J. 2878, Q.47, Q.50, Q.58, Q.61, Q.70 and Vesta.

**Millaquin Mill Area**

C.P.29/116, N.Co.310, Pindar, P.O.J. 2878, Q.47, Q.50, Q.55, Q.58, Q.61, Q.70 and Vesta.

**Bingera Mill Area**

C.P.29/116, N.Co.310, Pindar, P.O.J. 2878, Q.47, Q.49, Q.50, Q.55, Q.58, Q.61, Q.70 and Vesta.

**Fairymead Mill Area**

C.P.29/116, N.Co.310, Pindar, P.O.J. 2878, Q.47, Q.50, Q.55, Q.58, Q.61, Q.70 and Vesta.

**Gin Gin Mill Area**

C.P.29/116, N.Co.310, Pindar, Q.47, Q.50, Q.55, Q.58, Q.61, Q.70 and Vesta.

**Isis Mill Area**

C.P.29/116, N.Co.310, Pindar, P.O.J. 2878, Q.50, Q.55, Q.58, Q.61, Q.69, Q.70, Q.72 and Vesta.

**Maryborough Mill Area**

C.P.29/116, Pindar, Q.28, Q.47, Q.50, Q.51, Q.58, Q.61, Q.70, Q.71, N.Co.310 and Vesta.

**Moreton Mill Area**

C.P.29/116, N.Co.310, Pindar, Q.47, Q.50, Q.58, Q.61, Q.70, Q.71, Trojan and Vesta.

**Rocky Point Mill Area**

C.P.29/116, N.Co.310, Pindar, Q.50, Q.61, Trojan and Vesta.

NORMAN J. KING,

Director of Sugar Experiment Stations.

## Approved Fodder Canes

Bureau of Sugar Experiment Stations, Brisbane, 1st January, 1960

All farmers are advised that the following are the varieties of cane which may be grown for fodder purposes in the sugar mill areas as set out below:—

**Mossman, Hambledon, Mulgrave, Babinda, Goondi, South Johnstone, Mourilyan, Tully, Victoria, Macknade, Invicta, Pioneer, Kalamia, and Inkerman Mill Areas:**

China, Uba, Co. 290, "Improved Fodder Cane", and Co. 301.

**Proserpine, Cattle Creek, Racecourse, Farleigh, North Eton,**

**Marian, Pleystowe, and Plane Creek Mill Areas:**

China, Uba, "Improved Fodder Cane", and Co. 301.

**Qunaba, Millaquin, Bingera, Fairymead, Gin Gin, Isis, Maryborough, Moreton and Rocky Point Mill Areas:**

China, 90 Stalk, "Improved Fodder Cane", C.S.R.1 (also known as E.G.), Co.301, and Q.60.

NORMAN J. KING,

Director of Sugar Experiment Stations.

## Control of the Black Beetle

By C. L. Toohey

As reported in the October, 1958 issue of the Quarterly Bulletin, the black beetle, *Heteronychus sanctae-helenae*, was responsible for causing severe germination failures in South Queensland in the Rocky Point mill area during the 1957 planting season. This was particularly so in grassland which had been brought into cultivation. The extremely favourable years of 1957 and 1958, together with the lack of any organised attempt at control measures, favoured the pest to such a degree that increased populations made their appearance in the spring of 1958. On this occasion the attacks were not confined to new land but included old cultivation, and extended to ratoon as well as plant cane.

In an attempt to control the pest, or at least to minimise the damage, a Woongoolba grower made use of 50 per cent. dispersible lindane mixed at the rate of one-half pound of material per 100 gallons of water. The solution was applied to the soil surface at the rate of 44 gallons per acre. However, it is considered that this application was on the light side and it would be better to use three-quarters of a pound per 100 gallons of water.

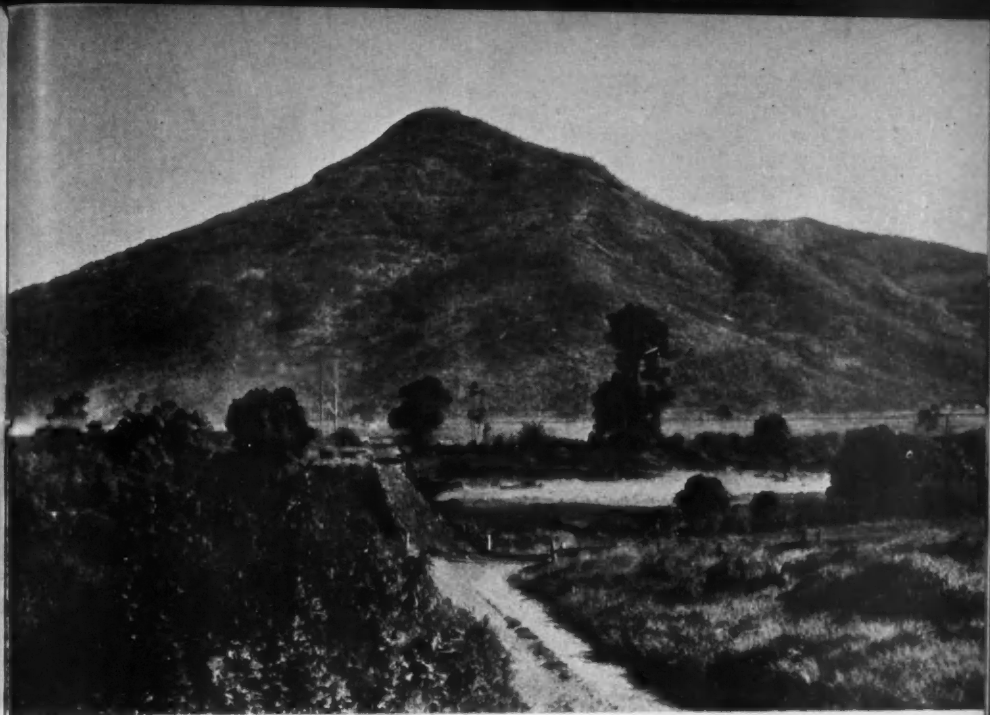
The method of applying the solution is of interest. In contrast to 1957 when damage was largely confined to plant cane, a high proportion of the attack was made on young ratoons. In his attempted control against the beetle, the grower found best results were achieved by the immediate burning of tops and trash following harvest, and the application of the spray to the ratoon stubble and surrounding soil. Since BHC and Lindane break down fairly quickly if left exposed to sunlight, the soil received a light rotary-hoeing following application of the spray. This ensured the persistence of the insecticide and its con-

tinued effect on migrating beetles. Pest populations were considerably reduced, and ratoons made normal growth.

On plant cane of up to one month's growth, spraying was performed with no soil coverage of the insecticide. It was found that beetles on, or near, the surface were killed quickly, and any lack of persistence of the insecticide did not result in further undue damage at the time. The sprayings were carried out in November and, by the beginning of January, small amounts of damage were again noticeable. This was apparently occasioned by a new generation of beetles. (Although *H. sanctae-helenae* passes through only one generation in a year, it was evident that an overlap of beetles had occurred following the plague-like populations encountered in 1957.

The above attempts at control, while largely successful, do not of course prevent initial attack by the beetle. It is at this point necessary to consider the economics of any control measures.

The ideal preventive measure is to protect the crop from the moment of planting by applying a layer of insecticide in close proximity to the sett, and by applying an additional layer incorporated in the soil surface. It is uneconomic, however, to treat an entire planting in this manner when the attack may be confined to only one block, or part of a block. It is suggested, therefore, that this method of preventive control be followed in the planting of any new land, particularly that brought in from pasture. The control practised by this grower could be followed in the case of an attack on ratoons or untreated plant cane. It is advisable however, at all times, to incorporate the insecticide with the soil as soon as possible after application.



**Fig. 46—Walsh's Pyramid dominates the Mulgrave flats.**

—Photo J. H. Buzacott

**Fig. 47—Farms of Burpu and Woree, Cairns district. Henley Hill reservoir in centre.**

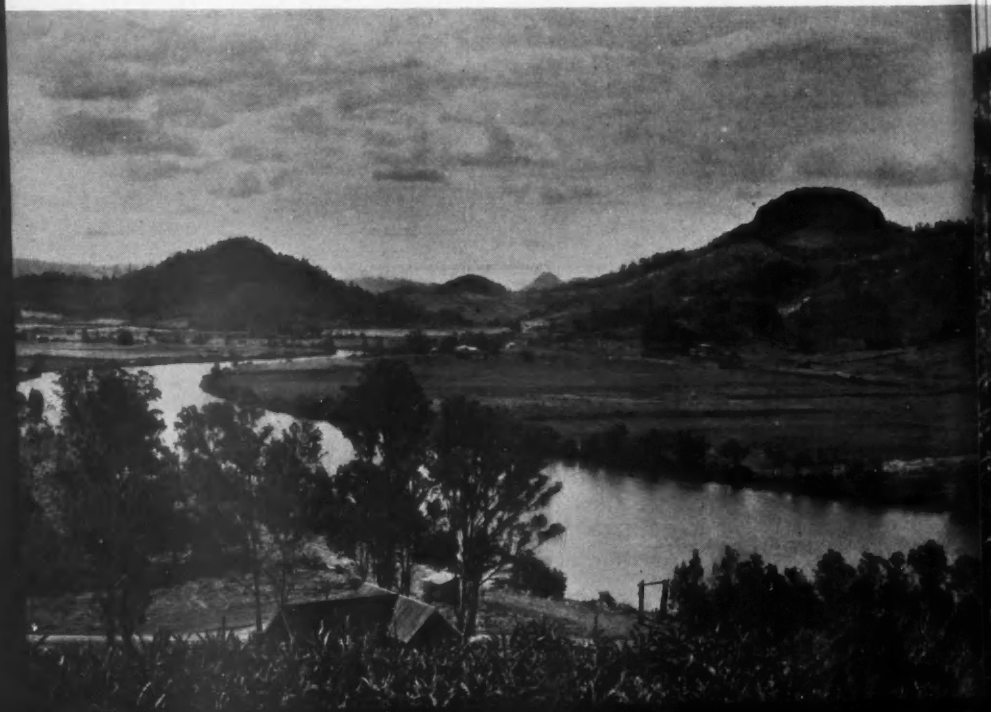
—Photo J. H. Buzacott





**Fig. 48—The heavily shielded case which contained the radioisotope used in Qunaba sub-sjder tests. It is shown here being transhipped at Brisbane on its London to Bundaberg flight.**  
—“Courier-Mail” Photo

**Fig. 49—Sugar lands, Maroochy River.**  
—Photo Department of Agriculture and Stock





**Fig. 50—Bagged sugar on pallets being loaded on to road transport by a fork lift at Mossman mill.**

—Photo L. G. Vallance

**Fig. 51—Young ratoon leaves, Nambour district.**

—Photo Department of Agriculture and Stock

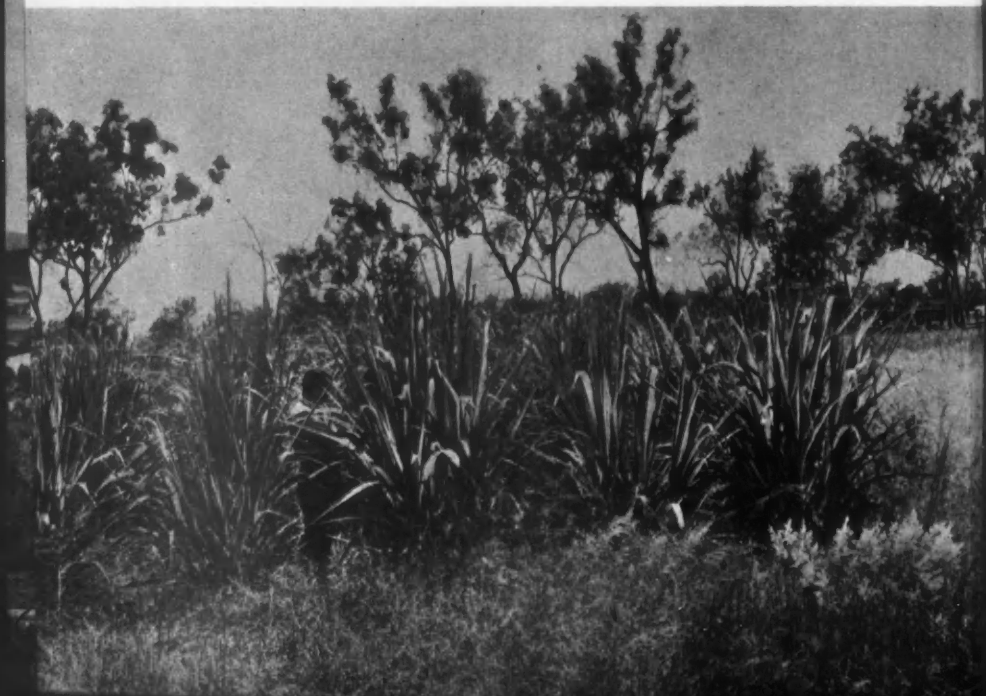




**Fig. 52—An impressive stand of Q.66 on a Tully farm. The crop yielded 60 tons per acre and remained erect. This is rich, new land where other commercial varieties lodge freely.**  
—Photo S. O. Skinner

**Fig. 53—All varieties entering Ayr from other districts are isolated at Millaroo for a year. This guards against disease introduction into an area where chlorotic streak and leaf scald do not exist.**

—Photo J. Wesdorp



## Use Lindane Advantageously but Carefully

By R. W. MUNGOMERY.

Several growers or their employees in the Burdekin district, who, during the past season, applied lindane to the soil to protect their cane against white grub attack, have indicated very definitely that they prefer this method of crop protection to that of applying crude BHC dust to achieve the same result.

They pointed out that they can apply the lindane spray at a much faster rate than the BHC dust, so this reduction in the cost of application can be added to the already appreciable saving effected by the use of the less expensive lindane. Furthermore, it was said that, by spraying, a better distribution of the insecticide is obtained in the half-open drill, and this in turn would tend towards a more uniform control of the pest.

However, in addition to these monetary and other advantages, they stressed the importance of greater bodily comfort which attends the use of lindane spray. One grower claimed that he no longer had to dismount from his tractor at the end of every round and wash out his eyes because of the stinging effect of the BHC dust which was blown up from the distributor. Others stated that they ceased to have that disagreeable musty odour clinging to their clothes and hands, as had been the case when they used BHC dust, despite the vigorous

washing and scrubbing, and copious bathing after work.

At least ten tractor-mounted spray units for applying lindane were operating in the Burdekin district during the 1959 season. Many of these were being made available on a very attractive hire basis to growers who did not own their own units.

Arrangements were also being made by one of the manufacturers of this type of spray equipment to hold a series of demonstrations on farms in the northern cane-growing areas from Ingham to Mossman, where grub attack can usually be anticipated. It is expected that these demonstrations will quickly popularize this method of cane grub control.

Growers should, nevertheless, not allow their enthusiasm for this product and this quicker and more pleasant method of application to over-ride the prudent caution which they should always adopt towards the use of any of the agricultural chemicals now on the market. Some can be quite dangerous if used irresponsibly—others are less so. However, BHC can cause various allergies such as hay fever and dermatitis, and since lindane is merely the active constituent or the purified gamma isomer of BHC, it would be as well to treat lindane with the same respect as that accorded to any other of the chemicals which may cause harmful effects.

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## New Grower Member on Bureau Board

The term of the present Sugar Experiment Stations Board expires on June 30, 1960, and the sudden death of the canegrowers' representative (Mr. L. G. Scotney) in late November necessitated the appointment of a new representative for the remaining seven months of the Board's term.

The vacancy was filled by the

appointment of the Chairman of the Queensland Cane Growers' Council, Mr. B. Foley. Mr. Foley made himself available at short notice to attend a Board meeting on December 7th and 8th, and he will represent the canegrowers of the State in any other Board discussions between now and the end of June.

## Four New Varieties — Q.69, Q.71, Q.72, Q.73.

Growers will notice the appearance of four new "Q" canes in the list of approved varieties published in this issue. These are Q.69, Q.71, Q.72 and Q.73. The first three were produced at the Southern Sugar Experiment Station at Bundaberg and the last-named is a product of the Central Station at Mackay. All four have undergone extensive trials for several years and have demonstrated their ability to satisfy a need for better canes under certain conditions in these districts.

For example, Q.71 is capable of excellent c.c.s. figures in the early part of the season, particularly in the Maryborough district, and although it is not a heavy cropper or a particularly vigorous variety, its good quality is of considerable value for early harvest. Q.69 and Q.72 are successfully competing with the well established favourite — C.P.29/116 — on the droughty hillside slopes of the Isis. Both seem to have better standover possibilities than the latter cane. Q.73 gives satisfactory crops on the better soils of the Mackay district, and since many of these are subject to seasonal flooding the resistance of this variety to bacterial mottle disease is a very valuable attribute.

For the present, these varieties are being released only in those districts in which they have been tested and found suitable but they will ultimately be tried out at all other centres in accordance with the Bureau's policy in this respect. Growers in those areas for which they have now been approved will be interested in the following descriptions of these new canes:—

### Description of Q.69

Q.69 is a seedling selected from the cross Co.281 x C.P.29/116 raised at the Bundaberg Sugar Experiment Station in 1946 and formerly identified as H.25. It has thin, slightly zig-zag, brownish-red stalks with a heavy coating of wax and this gives a whitish appearance to

protected portions of the stalk. The root band is yellow and merges into the general stalk colour. The variety has an erect top with long, thin leaf blades and in consequence the cover in the mature crop is somewhat open. The leaf sheath is almost hairless and trash slightly clinging. The buds are small, round and plump and closely adhere to the stalk so that they are well protected. Germination, early vigour and ratooning are good and cover in the young crop is satisfactory. Arrowing is free and the variety appears to reach its sugar peak at mid-season and retains it well until late in the season.

Generally speaking, Q.69 can be regarded as a C.P.29/116 type and in a standover crop it appears to retain slightly better condition than the latter variety if harvested at 20 months or over. On limited experience it is frost-resistant. It is also resistant to downy mildew disease but is somewhat susceptible to mosaic when grown in the presence of this disease.

Q.69 is recommended for the more drought-susceptible soils of the Isis district where it should prove a useful alternative for the widely grown C.P.29/116.

### Description of Q.71

The number Q.71 has been allotted to the variety formerly known as L.77, which was raised as a seedling at the Southern Sugar Experiment Station in 1950 from the cross Co.270 x P.O.J. 2878. Its parentage is interesting because it has the same female parent as both Trojan and Pindar, two of the most important Queensland varieties. Q.71 is a cane of erect habit with stalks of medium thickness which are yellowish-green when unexposed to light but attain an olive-green colour when exposed. The internodes are slightly staggered and the buds small, oval and slightly full. The variety has a fringe of hairs on the leaf scar but

these are less prominent than those in Pindar which serve to distinguish that variety. The foliage is erect and fan-shaped with leaves of medium width. It has a somewhat slow but uniform germination and subsequent vigour is good with growth maintained well into the winter. Stooling is compact and the cover satisfactory whilst ratooning is strong and even.

Q.71 is characterised by a very high early sugar content which is well maintained through the season. It is adaptable to a wide range of soil types and conditions in South Queensland. It lodges on rich land and its vigour is low on dry, poor soils. It appears to be highly resistant to mosaic disease but is susceptible to ratoon stunting and Fiji disease and moderately susceptible to downy mildew.

#### Description of Q.72

The number Q.72 has recently been allotted to the seedling formerly known as H.46, which was selected at Bundaberg in 1947 from the cross Co.281 x P.O.J.2878. It has brownish-red stalks of an average thickness of one and a half inches and is covered with a light waxy bloom. There is a clearly defined wax band and a yellow root band. Growth cracks are typical of the variety but stem rots have not been observed in it. The leaf sheath is light green with few hairs and the trash is slightly clinging. The buds are slightly elongated and are appressed to the stalk but, with age, tend to become prominent and are then liable to mechanical damage. Germination is variable and this is probably associated with the prominence of the buds. The vigour of primary shoots in both plant and ratoon cane is excellent but stooling is slow and in consequence early cover is only fair. In the mature crop wide leaves somewhat compensate for the only medium stooling and the tendency towards open growth.

Arrowing is sparse in Q.72 and the variety would appear to have possibilities as a standover crop. Trials to date in the Isis area show it to be slightly superior to Vesta and P.O.J.2878 for

this purpose. Its sugar content as a one-year crop indicates mid-season maturity.

Q.72 shows a marked tolerance to droughty conditions and in this respect should prove of value in the Isis district. It is somewhat susceptible both to Fiji and downy mildew diseases and it is in a number of current trials to determine its resistance to other diseases. So far, stem rots have not affected it in the field and it has shown little infection with pokkah boeng. Although the variety shows internal stalk symptoms similar to those of ratoon stunting disease these have been determined as a varietal characteristic, not indicative of a diseased condition in Q.72.

#### Description of Q.73

The number Q.73 has now been applied to the seedling I.106 raised at the Central Sugar Experiment Station in 1947 and first selected there in 1948 from the cross Trojan x Eros. The colour of the stalks varies from yellowish-green to reddish-brown, according to the amount of exposure they receive and a light wax coating is present. Stalk size is medium to thick and the internodes tend to be bobbin-shaped. The variety has a Trojan-type top but gives better cover than Trojan. It does not arrow under good growing conditions in the Central district but arrows when conditions are not conducive to good growth.

Q.73 gives a quick, good, germination although not as rapid as Q.63. It develops a good stool and maintains steady and even growth throughout the season. It is a good ratooner and has a good early sugar content except on the richer soils, and both mid and late-season sugar is good. It produces good crops on first class forest and on all alluvial soils of the Central district under a variety of climatic conditions. It does not readily lodge, withstands flooding and wind damage, and has a high degree of field resistance to bacterial mottle. It is also resistant to leaf scald and gumming diseases and appears resistant in the field to mosaic

and red rot. It is susceptible to ratoon stunting disease, chlorotic streak, downy mildew and yellow spot. Its susceptibility to the two last mentioned diseases is not surprising since both its parents are markedly susceptible to them.

It is considered that Q.73 will find a place on the better forest soils of the central district and will to a large extent replace Q.57 on flooded, bacterial mottle-affected fields in this area.

L.G.V.

## A Cane Rake for Heavy Work

A problem with high powered tractors is that, frequently, the implements available are called upon to do work beyond their capacity. Breakages then occur at a critical time resulting in much inconvenience.

Messrs. Toft Bros., Bundaberg, have developed a cane rake to suit heavy conditions often encountered on their farms.

depth and they also prevent buckling of the legs when lowered to the ground. A feature of the implement is the arrangement of the tynes into gangs of three, each gang being spring loaded. This enables the contour of the ground to be followed and, to a lesser extent, minimises breakages. Each tyne, as shown, is of  $\frac{1}{4}$  inch octagonal spring steel and the slight bend in the leg is

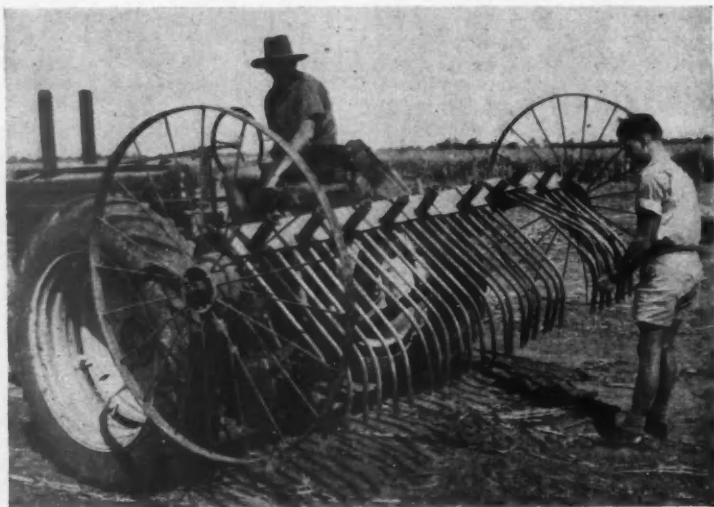


Fig. 54—A heavy duty cane rake.

—Photo N. McD. Smith

In heavy going, such as a large volume of post-harvest rubbish over an uneven surface, the rake, as illustrated, does a very good job. The unit is attached to the three point linkage of a tractor, and is operated with a power lift. Wheels are provided to control

considered to give a quicker dumping action.

There are thirty legs divided into ten independently moving gangs and the effective width of the implement is nine feet six inches.

N.McD.S.

## The Use of Insecticides to Control Subterranean Insects in Taiwan\*

By R. W. MUNGOMERY.

In Taiwan three species of wireworms cause damage to germinating setts. To prevent this, the drill is first opened, and fertilizer is applied at the bottom of the drill. Aldrin dust at the rate of 1lb. of active ingredient per acre is then thoroughly incorporated in two or three inches of soil at the bottom of the drill, and

white ants and black beetles, were seen on the Taiwan Sugar Corporation's plantation at Touliu. The first experiment which had been planted on unirrigated land in August, 1957, had been harvested early in 1959, and was showing a young ratoon crop (Fig. 55) when seen towards the end of April, 1959. Three kinds of insecticidal dusts



Fig. 55—First ratoons of an experimental plot on the Taiwan Sugar Co.'s plantation. Two aldrin treated plots on left and BHC treated plot on right.

—Photo R. W. Mungomery

the cane sett is then planted in this aldrin-loaded soil. BHC used at a similar rate and manner is apparently too toxic for the sett roots to develop in, so aldrin is used in preference.

White ants also cause trouble in certain areas, but the control measures adopted against black beetles and wireworms are generally sufficient to counter any threat from these pests.

Two very interesting randomised experiments involving the use of soil insecticides against the above complex of subterranean insects, i.e., wireworms,

were used, namely (1) BHC 2.5 per cent. g.i.; (2) aldrin 2.5 per cent.; and (3) aldrin 1.75 per cent. +BHC 0.75 per cent. g.i.

The active ingredient of each insecticide or mixture of insecticides was applied at the following rates:—

(a) 2lb. per acre applied at time of planting.

(b) 1lb. per acre applied at time of planting.

(c) 1lb. per acre applied at time of planting plus 1lb. per acre applied at time of final hilling up.

\*Extract from a report on a recent visit to Taiwan by Mr. Mungomery.

(d)  $\frac{1}{2}$  lb. per acre applied at time of planting plus  $\frac{1}{2}$  lb. per acre applied at time of final hilling up.

(e) Check—no insecticide treatment.

From an examination of the plots of young ratoons which constituted a most spectacular experiment, it was evident that all aldrin treatments had given excellent control, 1 lb. aldrin tical analysis of yield data from the

harvest of the plant crop was not available at the time of my visit, so there was no indication of any significant differences between aldrin and aldrin plus BHC on the one hand, and split applications and single dressings of these insecticides on the other hand. However, information on these points will be sought as soon as possible and it will be of interest to learn, in due course, of the degree of protection



Fig. 56—Plant crop showing untreated control in foreground, with insecticide treatments in background. Taiwan Sugar Co.'s plantation, Taiwan.

—Photo R. W. Montgomery

treatment being somewhat near the minimum required to give effective protection for the first ratoon crop. The cane in the check plots had almost completely failed, while the 1 lb. BHC treatments appeared to be intermediate between the check and the corresponding aldrin treatments. Since all insecticide treatments had apparently given a satisfactory germination in the first instance, it appeared that the residual effect of BHC was not so effective as aldrin in protecting the first ratoons against those soil-frequenting pests. The complete statis-

conferred by these various treatments on the second ratoon crop.

A second experiment of similar design on irrigated land on the same Touliu plantation involved a plant crop and, when seen, the age of the cane was eight months. The rates of active ingredient per acre and method of application of the insecticidal dusts used were as follows:—(1) aldrin 2.5 per cent.; (2) aldrin 1.75 per cent. + BHC 0.75 per cent.; (3) heptachlor 2.5 per cent.

Here again the results were almost equally spectacular (Fig. 56), and cane

in all of the check plots had failed in varying degrees, the stand being rated from bad to very bad. Couch grass had invaded many of these check plots, while the treated plots were clean, and showed no encroachment of grasses and weeds. The plots that had been treated with insecticides had a uniformly good stand of well-stooled cane, but at this stage there were slight indications in most replicates that the cane in the heptachlor plots was somewhat better than the cane in the corresponding plots of the other insecticide treatments. However, this experiment was only in its initial stages, and it will be some two or three years before results are available to gauge the comparative residual effects of heptachlor and aldrin in this particular soil type, and to evaluate their role in protecting this crop during its complete cycle. Interest, however, was being focussed on heptachlor because of its reputed cheaper

price in Taiwan than aldrin. Moreover, its residual qualities in other countries have usually been equally as satisfactory as aldrin, so this insecticide may have some future in Taiwan for the control of the subterranean insects. Its toxicity to a number of soil pests of sugar cane in Queensland is currently being tested.

In still another experiment which was seen, the same total quantity of aldrin, but formulated in different ways, was applied to separate plots of plant cane for the control of this complex of soil insects. These aldrin formulations included an emulsion, a wettable powder and a dust, and there was no noticeable difference showing in the first ratoon crop, all plots showing effective control. This appeared to indicate that the residual toxicity of all three formulations was, up to that stage, equally effective in preventing damage by these soil pests.

## Bound Copies of Quarterly Bulletin

The Bureau has in stock a small number of bound copies of Volumes 21-22 of the Cane Growers' Quarterly Bulletin. These are available to growers and millers in the industry at a price of 16/- each. Any orders should be addressed to the Bureau of Sugar

Experiment Stations, 99 Gregory Terrace, Brisbane.

The price to overseas purchasers will be £2/16/- (Aust.), which includes the cost of the two years' issues of the Bulletin which are bound to make Volumes 21-22.

## Nematodes and Sugar Cane

By H. E. YOUNG.

Nematodes or eelworms are unsegmented worms and include such things as hookworms and thread worms of man; root knot, leaf drop and burrowing nematodes of plants as well as thousands of species of fresh water, marine, and soil inhabiting types.

They are usually cylindrical in shape and swim in water, or move through moist soil. Nematodes may live on decayed organic matter, they may be cannibalistic or may feed on fungi, algae, higher plants, earthworms, insects and other animals. All species live in association in, or on, other animals or plants. Some are confined to feeding on higher plants, and it is these which concern the cane farmer directly. These may be external migratory parasites (grazers) wandering in the soil from root to root as in the case of dagger nematodes; or they may be internal migratory species moving around and feeding within the plant tissue, for instance, the Root Lesion nematodes; or internal sedentary species staying in the one place in the plant like the Root Knot nematode.

The damage they cause is due to their salivary enzymes acting as poisons and to the withdrawal of food from the plant. They also destroy roots, and thus reduce the absorption of water and nutrients by the plant. The damage they cause also allows the entrance of parasitic fungi and bacteria.

Disease-causing nematodes are spread with the movement of plant products, such as planting material, but they also move in soil, water, on insects, in the dirt on implements, on man's shoes, and by many other means incidental to farming procedures.

Plants affected by root parasitic nematodes may show root galling, root browning, and root lesions or wounds, stubby or swollen root tips, and excessive root branching with above ground stunting, chlorosis and various types of evidence of nutritional

deficiency and easy wilting. Plants affected by bud and leaf nematodes may show dwarfing, leaf crinkling, leaf browning and leaf dropping.

Nematodes may be controlled in the soil by steam heating the soil in the case of nursery beds or by fumigation, which is the usual process under field conditions. Fumigation depends upon the principle of putting liquids that vaporize, into the soil. These liquids disperse in the soil as vapours. As a general rule, soil at the time of fumigation should be in good planting condition, with sufficient soil moisture for germination purposes, but not too wet. The most generally used fumigants in Australia are DD, EDB and Nemagon. In temperate climates mercury compounds are used to control certain cyst-forming species.

In Queensland, the occurrence of parasitic nematodes in large numbers in association with poor growth, poor ratooning and poor germination patches in cane, which could not be explained by fertility, disease or other usual factors, led to an investigation of the role which nematodes might be playing in this problem. In general, much higher populations of parasitic species were found in, and adjacent to, the affected sites, than in areas of normal growth. These affected areas are not uncommon in most cane growing districts of Queensland.

The species of nematodes which were most commonly found were:— Root Lesion nematodes (*Pratylenchus zeae* and *Pratylenchus brachyurus*), Spiral nematodes (*Helicotylenchus nannus*), Dagger nematodes (*Xiphinema pratensis* and *Longidorus* sp.), Burrowing nematodes (*Radapholus similis*), Stunt nematodes (*Tylenchorhynchus martini*), Ring nematodes (*Criconema rusticum* and *Criconemoides* sp.), Stubby Root nematodes (*Trichodorus minor*), and Root Knot nematodes (*Meloidogyne* sp.).

In most cases several species were

found associated in any one infestation and in all cases typical damage was found on the cane roots.

There is some observational evidence that some varieties of cane growing in Queensland are more tolerant or resistant to nematode attack than others. This line of investigation is being pursued.

#### Soil Fumigation Trials.

Exploratory soil fumigation trials using standard nematocides were set out with the object of assessing the effect on production which the nematodes might be causing. The fumigants used were EDB (ethylene dibromide), DD (1,3-dichloropropene and 1,2-dichloropropane) and nemagon (1,2-dibromo-3-chloropropane). The applications were made as both row and broadcast treatments and at varying dosage rates. Nemagon was applied as a post-plant, pre-plant and ratoon treatment, whilst EDB and DD were used as pre-planting applications.

Observations in the Bundaberg district on a trial with well advanced plant cane were of interest. The cane was heavily infested with root knot nematodes at the time of treatment with nemagon. The fumigant was applied at 5 and 2.5 gallons per acre. Four months after treatment only an occasional new root knot had appeared in the 5 g.p.a. plots, whilst numerous knots had appeared in the 2.5 g.p.a. and untreated plots. Population counts of parasitic nematodes in the soil in the 5, 2.5 and 0 g.p.a. treatments were in the ratio 250:2410:8680 nematodes per 500 grams of soil. It would appear from this, and the relative numbers of root knots occurring, that the 5 g.p.a. dosage was sufficient to control the egg laying of the eelworms in the knots, or to persist long enough to kill the larvae as they hatched, whilst the 2.5 g.p.a. dose was insufficient to do this as effectively. Soil population counts from all plots indicate that the dagger nematode was more resistant to nemagon than the other species encountered.

Trials at Pinnacle, in the Mackay district, in an infested area, showed that DD treatment at 20 g.p.a. prior to planting, resulted in an estimated crop increase of at least 10 tons per acre more than in the control plots. EDB at the same rate gave an intermediate result. Much quicker germination occurred in all treatments than in the untreated plots. On ratoon cane at the same place a similar estimate of 10 tons per acre increase was obtained by fumigating with nemagon at 2.5 g.p.a.

At Mackay also a trial set out on a ratoon field produced similar results with nemagon at 2.5 g.p.a. This treatment proved much superior to 1.25 g.p.a. nemagon. Granular nemagon produced an equivalent response to the liquid form at an equivalent dosage. The weight of cane per acre at harvest due to the treatments was:—Nemagon at 1.25 g.p.a. = 19.10 tons, nemagon at 2.5 g.p.a. = 22.2 tons, untreated control = 13.15 tons.

Periodic eelworm counts made on samples from trial areas after fumigation showed a gradual recovery in population over the period. Ten months after fumigation the population of the EDB plots had risen to one-fifteenth of the numbers in the control plots, whilst in the case of DD, the population had risen to one-fifth of that in the control plots. Despite this, the DD treatment resulted in the greater cane yield.

On the Lower Burdekin, a trial comparing DD and EDB at 25 g.p.a., resulted in an estimated gain of 10-15 tons per acre, with the DD again producing the greatest response. Nemagon at 2.5 g.p.a. on ratoon cane also effected a good response. The DD and EDB treatments again resulted in quicker germination.

At Babinda, a trial using nemagon at 1.25, 2.5 and 5 g.p.a., as both row and broadcast treatments was set out in young plant cane. There was no apparent difference in result between row and broadcast treatment at the same rates, and all dosage rates caused

a development of intense green colour in the foliage. The 2.5 g.p.a. produced an estimated increase in crop of over 15 tons per acre, whilst the 1.25 g.p.a. rate gave less response. There was no difference in response between the 2.5 and 5 g.p.a. treatments. A 2.5 g.p.a. treatment of ratoon cane on the same farm produced an estimated extra crop of 20 tons per acre. After harvest the early ratoon growth shows a carryover stimulation in the treated plots.

The response to all treatments in the trials mentioned was expressed by a greater number of stalks per stool, and an increase in stalk diameter as compared with the untreated cane. Differences in length of stalk were not obvious. In all cases, fumigated cane was greener than the controls, and this was particularly the case with

DD applications. Treatments were followed by an early and vigorous root development, with relative absence of nematode injury to the new roots. No significant differences in sugar content of the juice were found between treated and untreated cane.

In view of the promising results obtained further trials have been set out with a more detailed layout. These should allow a more exact evaluation of responses, dosage rates and costs per acre. However, until further information is obtained from the Bureau's investigations, no firm recommendations for treatment of infested sugar cane soils can be given, and growers are advised to await the results of further research rather than incur what may be unwise expenditure on expensive treatments which may give an uneconomic crop response.

## Control of Centro Seed

Centro (*Centrosema pubescens*) is a very useful and nutritious leguminous plant in cattle pastures. For many years stock owners in humid tropical and sub-tropical areas have sown their cattle paddocks with Centro seed. It is able to establish itself in competition with the various grasses and greatly enhances the food value of the natural pasture.

Queensland's requirement of this seed has not been available from local sources and it has been necessary to import it from Malaya. Unfortunately much of the seed brought to the sugar districts in this way was contaminated with seeds of the giant sensitive plant. Backed by the various sugar organisations the Queensland Government took prompt action and all such seed entering Queensland ports has been subjected to rigid inspection and thorough cleaning to eliminate any giant sensitive plant seed that might be present.

It was not possible, however, to take such measures with parcels of seed forwarded direct to Queensland districts via other States, and this was respon-

sible for the outbreak of the pest in several widely scattered districts. Representations were made to the Commonwealth Quarantine authorities for assistance in sealing off this avenue of entry of the unwanted pest.

Therefore, it is with considerable satisfaction that we are now able to record that newly amended Commonwealth legislation now prohibits the entry of Centro seed into Australia other than through the port of Brisbane. This means that all such seed will be intercepted by the Standards Branch of the Queensland Department of Agriculture and Stock and will be immediately subjected to inspection and testing. The thorough methods instituted by the Department and the experience it has already had in dealing with previous importations reduces immensely the possibility that further contaminated Centro seed will be planted. In addition it renders less difficult the practicability of recording and checking known plantings of Centro.

L.G.V.

## Appeal for Fire Control

By J. H. BUZACOTT

Fire has become a good servant to the cane farmer. In spite of the annual destruction by fire of the organic material provided by tops and debris the cane crop still flourishes and it is evident that many of the gloomy predictions, which were made when burning first became universal, have not been realised in practice.

the flame-devastated rain forest, also harbours pests, not the least of which are wallabies. Furthermore, those farmers whose properties are on the slopes and in the foot hills will undoubtedly be exposed to greater erosion risks with the removal of the trees, the roots of which assist in slowing the rush of waters down the



Fig. 57—Fire from a cane burn sweeping through the Islay Hills, Cairns district.

—Photo J. H. Buzacott

It is, however, easy for the good servant to become a bad master, and the carelessness of some farmers, or their employees, in allowing fires to get out of control is something to be deplored. Each crushing period in North Queensland sees fires eating deep into the rain-forest clad hills. Each year sees larger and larger areas denuded of trees.

Admittedly the rain forest harbours some pests of sugar cane such as pigs and 'possums but it is well to remember that the blady grass and open forest, which gradually but inevitably replace

mountainsides during wet season deluges. Apart from any other aspect one's neighbour deserves consideration, and only too often does a fire started on one side of a hill burn out an adjacent neighbour or one on the other side of the hill.

The final result of these uncontrolled fires will undoubtedly be treeless hillsides, and it seems that North Queensland is destined in the near future to have its landscape of attractive jungle-clad mountains replaced by a spectacle of grassy hills like those of the highlands of New Guinea which have

reached that state from years of burning off by the natives who burn the grassland in order to acquire animals for food with the minimum of labour.

Following the displacement of rain forest by grasses it can be expected that grass fires will annually sweep the hills and North Queensland mountains

will then resemble the "Black Hills of Dakota" rather than the "Green Hills of Somerset".

The accompanying photograph shows a fire, initiated as a cane burn, sweeping unchecked over the Islay Hills near Gordonvale.

## New Seedling Sub-Station at Tully

Some years ago the Bureau established a seedling sub-station in Innisfail to help improve selection of new cane varieties suitable for the "wet belt".

During the spring of 1959, following requests from the sugar organizations in Tully, an additional but smaller sub-station was commenced in this area on the farm of Messrs. M., G., and H. Ballini, Lower Tully.

The accompanying photograph shows

the initial planting of setts of numerous varieties. Representatives of the Tully Junior Farmers' Club took an active interest in the sub-station, and may be seen assisting with the work.

The site is on rich soil and is located on the second level of a river bank. Since the Innisfail sub-station is more suited to the development of varieties for medium and poor lands, the Tully plot will prove a valuable adjunct.

S.O.S.



Fig. 58—Initial planting at the new Tully seedling sub-station.

—Photo S. O. Skinner

## Meringa Field Day Address

By Norman J. King

Over a period of years we have witnessed in Queensland the control, and in some cases the eradication, of the more important cane pests and diseases. We have now reached the stage where a concentration of effort can be directed at what is now the major disease problem. I refer to chlorotic streak which is responsible for serious crop losses in many districts.

This disease has been known to exist in Queensland cane fields for some thirty years and it was probably here a long time before that. For many years chlorotic streak was confined to the areas north of Townsville and it is only in the last few years that it occurred in the Mackay, Bundaberg, Maryborough and Giru districts. To-day the only district completely free of the disease covers the three mill areas of the Lower Burdekin. The extension of the disease to these other areas in recent times is somewhat puzzling in view of the restrictions which are placed on movement of plants, but it is known that the unauthorised transfer of plants does take place occasionally and it is probable that chlorotic streak has been spread by that means.

Chlorotic streak has been described from time to time as a mystery and an enigma. It occurs in most sugar growing countries of the world and has been the subject of numerous investigations by a large number of pathologists; but little light has been shed on either the cause of the disease or the way in which it is spread from diseased to healthy cane.

Since no bacterium or fungus has been found to be associated with diseased plants it has been assumed that a virus is responsible for the condition, and some support is given to this belief by the fact that the disease can

be cured by a short hot water treatment. The disease is not transmitted mechanically by cane knives, nor can it be transmitted by inoculation of juice from diseased into healthy material. In this country there is no evidence that an above-ground insect is responsible for spreading it.

One of the accepted characteristics of chlorotic streak is that it is virtually limited to low-lying, wet areas where the soil may be waterlogged for extended periods during the wet season. Even in localities where such wet, flat areas may be immediately adjacent to higher, better-drained lands little, if any, disease is found on the higher country. This suggests that the wet soil conditions are essential for either the spread of the disease or the expression of the leaf symptoms.

Another factor contributing to the spread of the disease has become more clearly evident in the relatively recent outbreak in Mackay. Since the first finding of chlorotic streak there in the summer of 1953-54 the disease has spread progressively through farms bordering water courses, indicating that it is carried in some way by flood and drainage waters.

During the years that the presence of this disease has been known to us a considerable amount of time has been spent on investigations as to its cause; but the time is now opportune, with other serious diseases under control, to tackle this problem in a more vigorous manner. And during the last year the work of our pathologists has been leading up to a detailed programme of investigation.

You may logically ask why we have to spend a lot of time, maybe years, on discovering what causes a disease, and how it is spread, before starting a campaign of eradication. The answer to that lies in the fact that

control and eradication measures can be planned and implemented more effectively if one has a complete understanding of the disease itself. I can explain this more easily by referring to some past experiences. When we attempted to control Fiji disease in the early thirties the job was made much easier because we had already established that it was spread by the sugar cane leafhopper, and we knew a good deal about the rise and fall of leafhopper populations at certain times of the year. The control campaigns were then designed so that inspections and digging out of diseased stools were conducted prior to the period of maximum spread of the disease. The effectiveness of the method was proved by the rapid control achieved.

Similarly with downy mildew disease. In that case prior research established that the fungal spores which caused the disease to spread were produced only in the warmer periods of the year and that they required conditions of high humidity for survival. The use of this knowledge plus the known resistance or susceptibility of all commercial canes allowed the planning of a successful campaign.

It is already common knowledge that chlorotic streak disease can be cured in the setts by a short hot water treatment, but the planting material is subject to reinfection if planted on land which previously grew diseased crops. The aim of the new investigation is to discover the organism or factor causing the disease, the way in which it is spread, the critical periods of the year and some method of field control.

You are all aware that crop losses can be severe and, in the case of very susceptible varieties, measures may have to be taken to prevent or limit

further plantings. Q.66 is a case in point. That variety is very valuable to some growers on rich lands, but its high susceptibility to chlorotic streak may limit its usefulness.

Now that we have reached a critical stage in our history when crop surpluses will probably be commonplace, we must appreciate that any further measures to reduce crop losses caused by disease will result in still more over-production. This can be the only outcome of successful control of chlorotic streak disease. But the attempts to control the disease cannot be halted on that account. All of our research is aimed at increasing sugar production on each acre of land, and if disease control does not do it varietal improvement will. But any method of raising production per acre will result in reduced costs on that acre, and the bringing of a disease under control will allow the use of more susceptible varieties which may otherwise have to be discarded.

In speaking previously to both growers and millers in the industry I have suggested that, in a period when production exceeds market requirements, the logical and most economic method of keeping production down is to reduce areas. Any attempts to cut down on output by using less fertilizer or by cultivating less efficiently will not reduce the cost of production of a ton of cane. But the maintenance of a high degree of efficiency on a reduced acreage will achieve the desired result in the most economical way. It will be something of a paradox if you continue to finance a research organization to improve industry efficiency and, at the same time, deliberately sacrifice your farm efficiency so as to farm your full area and produce less cane.

## The Isis Seedling Introduction Plot

By N. McD. SMITH.

The variety C.P.29-116 represents over 70 per cent. of cane crushed at the Isis Central Mill. This would indicate that the district has a specific set of climatic and soil conditions, allowing one variety to dominate the picture.

Without detracting from the worth of C.P.29-116, a preponderance of any

excellent striker and ratooner, be able to recover quickly after set-backs, and make quick progress during periods of growing weather.

Moreover, an ability to withstand adverse growth conditions following good weather periods is highly desirable. Whilst such conditions may be experienced elsewhere in Southern Queensland



Fig. 59—Planting the Isis seedling plot.

—Photo N. McD. Smith

one cane could pose a problem in the event of a necessary change in the varietal situation brought about by disease or some other factor.

The matter of introducing and growing a number of untried seedlings under local conditions has been considered, and the first plot of the new project was established during September, 1959. Much of the assigned area of Childers is undulating, and is prone to periods of soil moisture stress, which quite often approach drought seriousness. Therefore, the variety most suitable for general planting falls into a definite type. It must be an

they are accentuated in the Childers district, where there is an unfortunate lack of natural irrigation facilities. If water supplies were available to supplement rainfall, the evenness of crop progress could be maintained with a consequent wider range of leading canes.

The seedling introduction plot has been initiated on the farm of Mr. R. Kingston, North Isis, where an area of land has been made available to fulfil requirements. Over thirty untried canes will be planted each year and, for the time being, C.P.29-116 will be included for purposes of comparison.

## Random Gleanings

In our last issue a mention was made of work to be performed with a radioisotope. This was conducted at Qunaba mill during September, but we are still awaiting the analysis of the data by the Atomic Energy Commission. As was anticipated there was no danger to anyone in the mill or to those handling the sugar subsequently. The radiation count was well below the permissible exposure level. On this occasion the radioisotope had to be brought from England on a very tight flying schedule; but any future work can be conducted with active material from the Lucas Heights reactor in New South Wales. A photograph in the pictorial section of this issue shows the isotope being transhipped at Brisbane on its flight from London to Bundaberg.

A photograph in this Bulletin shows the distribution of the anti-lodging variety Q.66 in the Tully area during 1959. The plantings were limited to rich land where other available canes lie down with consequent low sugar content and high cutting costs. The distribution was a calculated risk, having in mind the variety's susceptibility to leaf scald and chlorotic streak diseases; but there is evidence to support the contention that Q.66 will remain relatively free from leaf scald if it is not growing alongside another infected variety. The advantages possessed by Q.66 on rich land—lodging resistance and reasonable sugar content—justify test plantings even where disease may constitute a problem. The limitation imposed on plantings will enable control to be exercised if a disease threat develops.

Cane growers in Queensland will be interested in the large fertilizer factory under construction in South Africa. It will be completed by June 1960 and will have a capacity of 110,000 tons of urea each year; that is equivalent to a quarter of a million tons of sulphate of ammonia. It would be assumed that the South African sugar industry would use approximately the same tonnage of nitrogenous fertilizers as would our own industry so it will be in the happy position of being able to draw all of its urea supplies from local manufacture.

If we could find a simple means of destroying the cane top during the pre-harvest burn, mechanization of the harvest would be nearer solution. This applies particularly to lodged cane where it is impracticable for a mechanical harvester to sever each top and leave it on the field. Even with the new Massey Ferguson harvester, which cuts the cane into short lengths, the unsevered tops constitute the bulk of the extraneous matter which finds its way into the bins. The Bureau is conducting some experiments with a new desiccating substance which, when sprayed on to green foliage, causes it to dry out within a few days. This material, if successful on cane leaves, would enable the green leaves to be consumed in the pre-harvest burning operation. It is unlikely that the green spindle can be destroyed in this way but, even if the leaves can be burnt, it will be a step in the right direction.

## **FREE SERVICES TO CANE GROWERS**

The Bureau offers the following free services to *all* cane growers in Queensland:—

### **Soil Analysis and Fertilizer Recommendations**

Your soil will be analysed by the most modern methods, and a report will be posted containing a recommendation covering the type of fertilizer required, the amount per acre, the need for lime, and other relevant information. Phone the nearest Bureau office and the soil samples will be taken as soon as possible.

### **Culture of Green Manure Seed**

Cultures and instructions for the inoculation of the seed of cowpeas, velvet beans, mung beans or any other legume will be posted to any cane grower upon request to The Director, Bureau of Sugar Experiment Stations, Brisbane. Allow a week after receipt of your letter for the culture to be prepared and posted, but as the culture will easily keep a month or so it is a good idea to get your culture when you get your seed. If sowing is delayed, ask for another batch of culture; there is no charge.

### **Advice on All Phases of Cane Growing**

The Bureau staff is at the service of all cane growers. They can best advise you on matters pertaining to varieties, fertilizers, diseases, pests, drainage and cultural methods. Bureau officers are available in every major cane growing district. A phone call will ensure a visit to your farm.



